No. 200800176

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

The Regents of the University of California

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) MAY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Lassik'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this thirtieth day of July, in the year two thousand and eight.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions*

Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME
UC1495

3. VARIETY NAME
Lassik

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
University of California
1111 Franklin Street, 12th Floor
Oakland, CA 94607-5200

5. TELEPHONE *(include area code)*
(510) 587-6000

6. FAX *(include area code)*
(510) 587-6090

FOR OFFICIAL USE ONLY

PVPO NUMBER
#200800176

FILING DATE
MARCH 25, 2008

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
Corporation

8. IF INCORPORATED, GIVE STATE OF INCORPORATION
CA

9. DATE OF INCORPORATION
January 1, 1868

FEES RECEIVED

FILING AND EXAMINATION FEES:
$ 4,382.00
DATE 3/25/08

CERTIFICATION FEE:
$ 768.00
DATE 5/5/08

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*
Michael R. Ward
MORRISON & FOERSTER LLP
425 Market Street
San Francisco, CA 94105

11. TELEPHONE (Include area code)
(415) 268-6402

12. FAX (Include area code)
(415) 268-7522

13. E-MAIL
Mward@mofo.com

14. CROP KIND *(Common Name)*
Wheat

16. FAMILY NAME *(Botanical)*
Poaceae

15. GENUS AND SPECIES NAME OF CROP
Triticum aestivum

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☑ NO

18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (***OPTIONAL***)
☐ YES ☑ NO
IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERCIALIZATION. _____

19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED
(Follow instructions on reverse)

a. ☑ Exhibit A. Origin and Breeding History of the Variety
b. ☑ Exhibit B. Statement of Distinctness
c. ☑ Exhibit C. Objective Description of Variety
d. ☑ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☑ Exhibit E. Statement of the Basis of the Owner's Ownership
f. ☑ Exhibit F. Declaration Regarding Deposit
g. ☑ Voucher Sample *(3,000 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
h. ☑ Filing and Examination Fee ($4,382), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD ONLY AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☑ YES *(If "yes", answer items 21 and 22 below)*
☐ NO *(If "no", go to item 23)*
☐ UNDECIDED

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES?
☑ YES ☐ NO
IF YES, WHICH CLASSES? ☑ FOUNDATION ☐ REGISTERED ☐ CERTIFIED
MAH 4/26/2008

22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☑ YES ☐ NO
IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS.
☑ FOUNDATION 1 REGISTERED 1 CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.) *

23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?
☐ YES ☑ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☐ YES ☑ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER	SIGNATURE OF OWNER
David R. McGee	
NAME *(Please print or type)* David R. McGee	NAME *(Please print or type)*
CAPACITY OR TITLE Executive Director Technology Transfer Services	DATE 3/19/08
CAPACITY OR TITLE	DATE

ST-470 (02-06) designed by the Plant Variety Protection Office using Word 2003.

#200800176

(See reverse for instructions and information collection burden statement)

GENERAL INSTRUCTIONS: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E, F; (3) for a tuber reproduced variety, verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in an approved public repository; and (4) payment by credit card or check drawn on a U.S. bank for $4,382 ($518 filing fee and $3,864 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice)*. **NEW:** With the application for a seed reproduced variety **or by direct deposit soon after filing**, the applicant must provide at least 3,000 viable untreated seeds of the variety *per se*, and for a hybrid variety at least 3,000 untreated seeds of each line necessary to **reproduce** the variety. Partial applications will be held in the PVPO for not more than 90 days; then returned to the applicant as un-filed. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a payment by credit card or check payable to "Treasurer of the United States" in the amount of $768 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)*

Plant Variety Protection Office
Telephone: (301) 504-5518 **FAX:** (301) 504-5291
General E-mail: PVPOmail@usda.gov
Homepage: http://www.ams.usda.gov/science/pvpo/PVPindex.htm

SPECIFIC INSTRUCTIONS:
To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and **provide evidence** that the permanent name of the application variety (even if it is a parental, inbred line) has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: U.S. Department of Agriculture, Agricultural Marketing Service, Livestock and Seed Programs, **Seed Regulatory and Testing Branch**, 801 Summit Crossing Place, Suite C, Gastonia, North Carolina 28054-2193 Telephone: (704) 810-8870. http://www.ams.usda.gov/lsg/seed.htm.

ITEM

19a. Give:
(1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach replicated statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

20. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

23. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

24. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

22. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

23. CONTINUED FROM FRONT *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

24. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

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22. Continued - ADDENDUM TO ST-470 - APPLICATION FOR PVP CERTIFICATE*

Foundation seed will not be limited to the number of generations. Foundation seed will be maintained solely by the University of California Foundation Seed Program. Registered seed will only be produced from Foundation seed.

"Lassik"

Exhibit A . Origin and breeding history of the variety

1. Parentage

Lassik "UC1495" is a short stature Hard Red Spring (HRS) derived from the University of California HRS variety Anza (CItr 15284, Qualset et al.1984). Anza has been used commercially for more than 20 years in California. Three independent backcrossing programs were used to introgress several genes into Anza that were then combined by crossing into the single variety Lassik.

The three backcrossing programs are described below:

Madsen/6*Anza. The objective of this backcrossing was to introgress the 2NS-2AS chromosome translocation from *T. ventricosum* carrying leaf rust resistance gene *Lr37*, stripe rust resistance gene *Yr17*, and stem rust resistance gene *Sr38*. The donor of the 2NS-2AS translocation was Madsen (PI 511673), a Soft White Winter wheat (SWW) developed in Washington, and jointly released by the USDA-ARS and the Agric. Exp. Stations of Washington, Idaho, and Oregon (Allan et al. 1989). A PCR assay (Helguera et al., 2003, Fig. 1) was used to introgress the 2NS chromosome segment from HRW 'Madsen' into HRS 'Anza' CItr15284. The BC_6F_4 seed of the Anza homozygous lines carrying the 2NS/2AS translocation was deposited at the National Small Grains Collection (NSGC) as Anza *Lr37/Yr17/Sr38* as PI 638742 (Chicaiza et al. 2005).

Fig. 1. Marker for 2NS translocation

Glupro-GPC/6*Anza. The objective of this backcrossing was to introgress the high grain protein content gene *Gpc-B1* recently cloned in J. Dubcovsky's laboratory (Uauy et al. 2006) and the stripe rust resistance gene *Yr36* (Uauy et al. 2005) also discovered in Dr. Dubcovsky's laboratory. The two genes are derived from the introgression of a chromosome 6BS segment form *Triticum turgidum* ssp *dicoccoides* (DIC). We used the hexaploid variety 'Glupro' ('Columbus'/*T. turgidum* var. *dicoccoides*//'Len') as the initial source of this segment since we demonstrated before that this variety carries the same chromosome segment from the same wild accession used in the mapping and cloning studies (Khan et al. 1998). The two genes are closely linked (0.3 cM apart) and, therefore were transferred together using molecular markers *Xuhw89* and *Xgwm193* (Fig. 2) flanking both genes (Uauy et al. 2005, 2006).

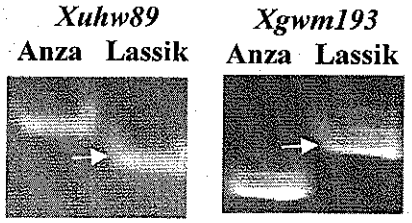

Fig. 2. Markers for *Gpc-B1* (*Xuhw89*) and *Yr36* (*Xgwm193*) genes. Arrows indicate wild alleles.

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Glupro-Glutenins/6*Anza. The objective of this backcrossing was to improve Anza gluten strength by replacing two high molecular weight glutenin (HMWG) alleles known to be associated with weak gluten. The *Glu-A1* 'null' allele from Anza was replaced by the *Glu-A1* '1' allele from Glupro. In addition, the *Glu-D1* '2+12' allele from Anza was replaced by the *Glu-D1* '5+10' allele from Glupro. SDS PAGE gels were used to select for the targeted alleles in each backcross generation. Homozygous lines for these two genes were selected after self pollination of the last backcross generation

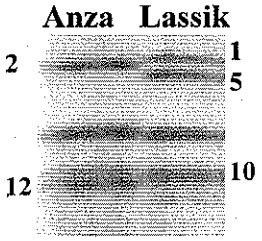

Fig. 3. High molecular weight glutenins

Pyramiding. The different genes introduced in the three backcrossing projects described above were combined using the crossing scheme described in Table 1. In December 2004 we selected three plants that were simultaneously homozygous for *Lr37/Yr17/Sr38*, *Gps-B1/Yr36*, and '1'/'5+10' that were designated as the starting material of 'Lassik'.

Table 1. Crosses and backcrosses used to combine the different introgressed genes into Lassik. In each backcross generation the lines carrying the targeted genes were selected with the molecular markers shown in Fig.1-3.

Anza/Glupro//Anza BC_1

98613/9*Anza BC_2

Selection for HMWG '1' & '5+10'

98620/8 * Anza BC_3

98627/2 * Anza BC_4

Anza * 99650/1 BC_5

99660/1 BC_5F_2

00667/2

Selection for *Gpc-B1 &Yr36*

98620/9 * Anza BC_3

98627/5 * Anza BC_4

Anza * 99650/5 BC_5

Anza * 99660/4 BC_6

00667/3

F_1

00677/1 BC_6F_2

00686/71 BC_6F_3 (Homozygous 1, 5+10, *Gpc-B1*, *Yr36*)

Selection for *Lr37/Yr17/Sr38*
(2NS-2AS translocation)

Madsen/Anza//Anza BC_1

98605/161*Anza BC_2

98644/49 * Anza BC_3

98618/27 *Anza BC_4

Anza * 98625/34 BC_5

99651/33 * Anza BC_6

00662/37 BC_6F_2 Homozygous

00674/59 BC_6F_3 Homozygous

00679/133 BC_6F_4 Homozygous

Pyramiding

F_1 (heterozygous: 1, 5+10, *Gpc-B1*, *Yr36*, 2NS translocation)

03670/14 F_2

04656 /13 F_3 (Homozygous 2NS translocation, *Gpc-B1*, *Yr36*,'5+10' and heterozygous '1')

'**Lassik**' - 04672/34, 35, 36. Homozygous 2NS translocation, *Yr36*, *Gpc-B1*, '1', '5+10'.

2. Breeding History

2. A. Stages of selection and multiplication

After the original plant carrying all the genes in homozygous state was recovered, the seed from three BC_1F_3 plants of experiment 04672/34-36 were planted in the greenhouse in the experiment 05055/21-23 during the winter of 2005, after maturity, the spikes were threshed in bulk and the seed was used to plant six large plots in experiment 05038/25 at Tulelake during the summer of 2005. One thousand heads were cut and threshed individually; the rest of the plants were threshed in bulk. The seed from the heads were planted as head rows in experiment 06001/15 at Davis to produce breeder seed in 2006; the bulked seed was used to plant the regional trials in 2006. The official UC number (UC1495) was assigned in 2006. One hundred and fifty four pounds of Breeder Seed was delivered to the FSP in 2006 for production of Foundation Seed in 2007. Foundation seed was produced in Tulelake in 2007. In 2006 it was tested in Regional Trials as UC1495 in seven locations under irrigation and two locations under rainfed conditions. Also, in 2006 it was grown as strip trials by Kent Brittan at four locations. UC1495 was part of the Collaborators Quality Evaluation in 2006.

2. B. Selection criteria

The plants were selected based on observation of the plants in the field, and objective yield and laboratory data. Elite yield trials were performed at three locations and Regional Trials were performed at 9 locations during 2006. Quality data was obtained from the California Wheat Commission Quality Laboratory for four locations in 2006. The following criteria were used:

1. Early flowering
2. Low stature and good agronomic appearance
3. High yield potential
4. Resistance to lodging
5. High protein content
6. Strong gluten and good breadmaking quality
7. High Molecular weight subunits 1 (*Glu-A1*) and 5+10 (*Glu-D1*)
8. Resistance to stripe rust, leaf rust, and septoria tritici blotch
9. Presence of a 2NS/2AS translocation from *T. ventricosum* carrying leaf rust resistance gene *Lr37,* stripe rust resistance gene *Yr17,* and stem rust resistance gene *Sr38.*
10. Presence of stripe rust resistance gene *Yr36* and high grain protein content gene *Gpc-B1.*

2. C. Characteristics by which the application variety can be distinguished from the recurrent backcross parent

Differences from Anza

Lassik has high molecular weight glutenin subunits '5+10' at the *Glu-D1* locus and '1' at the *Glu-A1* locus whereas Anza is 'null' for *Glu-A1*and has subunits '2+12' at the *Glu-D1* locus (Fig. 1). This results in stronger gluten in Lassik than in Anza.

Lassik has the *Gpc-B1* allele from high-grain protein content from *Triticum turgidum* ssp *dicoccoides* and a significantly higher level of grain protein content than Anza.

Anza is a feed quality variety whereas Lassik is an excellent breadmaking quality variety

Lassik has two additional stripe rust resistance genes (*Yr17,* Fig. 2, and *Yr36*) that result in improved resistance to stripe rust compared to Anza.

2. D. Statement concerning whether the variety is uniform and stable and how many generations the variety has been observed to determine this.

- Variety Lassik is uniform for all traits as described in Exhibit C (Objective Description of Variety)
- Variety Lassik has been reproduced and judged stable for the last three generations.
- Variety Lassik was stable in the Elite (3 locations) and Regional Trials (10 locations) during 2006 and 2007 and during the production of the Breeder's Seed and Foundation Seed in 2007.

E) Statement concerning whether there are genetic variants that are to be expected during normal maintenance of the variety, the description of the variants, and their frequency

- Variety Lassik shows the following variant frequency: Plants taller by 1 to 1.5 heads have been found with a frequency lower than five in 1000 plants. White grains have been observed with a frequency lower than five in 1000.

References

Allan R.E., C.J. Peterson, G.L. Rubenthaler, R.F. Line, D.E. Roberts. 1989. Registration of Madsen wheat. Crop Science 29:1575.

Helguera M., I.A. Khan, J. Kolmer, D. Lijavetzky, L. Zhong-qi, J. Dubcovsky. 2003. PCR assays for the *Lr37-Yr17-Sr38* cluster of rust resistance genes and their use to develop isogenic hard red spring wheat lines. Crop Science 43:1839-1847

Khan, I. A., J. D. Procunier, D. G. Humphreys, G. Tranquilli, A. R. Schlatter, S. Marcucci-Poltri, R. Frohberg, and J. Dubcovsky. 2000. Development of PCR based markers for a high grain protein content gene from *T. turgidum* ssp. *dicoccoides* transferred to bread wheat. Crop Science 40: 518-524.

Chicaiza, O., I.A. Khan, X. Zhang, J.C. Brevis, L. Jackson, X. Chen, and **J. Dubcovsky**. 2005. Registration of five wheat isogenic lines for leaf rust and stripe rust resistance genes. Crop Science 46: 485-487.

Qualset, C.O. , H.E. Vogt, N.E. Borlaug. 1984. Registration of Anza wheat. Crop Sci 24(4):827.

Uauy, C., J.C. Brevis, X. Chen, I.A. Khan, L. Jackson, O. Chicaiza, A. Distelfeld, T. Fahima, and J. Dubcovsky . 2005. High-temperature adult plant stripe rust resistance gene *Yr36* from *T. turgidum* ssp. *dicoccoides* is closely linked to the grain protein content locus *Gpc-B1*. TAG. 112: 97-105.

Uauy C., A. Distelfeld, T. Fahima, A. Blechl, J. Dubcovsky. 2006. A NAC gene regulating senescence improves grain protein, zinc and irons content in wheat. Science 314:1298-1300.

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'Lassik'

Exhibit B: Statement of Distinctiveness

Lassik "UC1495" is a Hard Red Spring variety. **The most similar variety to Lassik is its spring recurrent parent Anza.** Both varieties have similar height, heading dates and leaf color.

However, Lassik can be differentiated from Anza by its improved resistance to stripe rust, its stronger gluten, and increased grain protein content.

1. Lassik carries leaf rust resistance gene *Lr36*, stripe rust resistance gene *Yr17*, and stem rust resistance genes *Sr37*, from *T. ventricosum* which are absent in Anza.

These three genes are present in a segment of chromosome arm 2NS translocated to wheat chromosome arm 2AS, which is present in the winter parent Madsen. This 2NS segment does not recombine with the wheat chromosomes and is inherited as a single recombination block (Helguera et al. 2003). Therefore, a single molecular marker is sufficient to demonstrate the presence of the complete segment. Figure 1, shows the presences of the characteristic PCR amplification products from the 2NS genome, which are absent from the Anza samples using two independent pairs of primers published by Helguera et al. (2003).

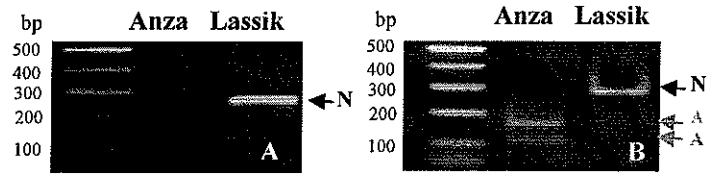


Fig.1. Genomic DNAs were extracted from Anza and Lassik breeder seed. Arrows labeled by "A" (in gray) and "N" (in black) indicate bands amplified from the A genome allele from wheat and the N genome from *T. ventricosum*, respectively. **A)** PCR amplification with 2NS specific primers VENTRIUP and LN2 (Helguera et al. 2003). The black arrow indicates the 2NS specific 262-bp PCR amplification product. **B)** PCR fragments amplified with primers URIC – LN2 followed by *Dpn* II digestion (Helguera et al. 2003). The black arrow indicates the 2N genome PCR amplification product (285-bp). The gray arrows indicate *Dpn* II digested fragments (166 and 109 bp) from the A genome of wheat. The first line in both figures is the size molecular marker.

These markers were published in Crop Science in 2003 and are widely used in marker assisted selection programs.

Reference

Helguera, M., I. A. Khan, J. Kolmer, D. Lijavetzky, L. Zhong-qi, J. Dubcovsky. 2003. PCR assays for the *Lr37-Yr17-Sr38* cluster of rust resistance genes and their use to develop isogenic hard red spring wheat lines. Crop Science. 43:1839-1847.

2. Lassik carries the high grain protein content gene *Gpc-B1* and the stripe rust resistance gene *Yr36* which are absent in Anza.

Chromosome 6B from *Triticum turgidum* var. *dicoccoides* accession 'FA15-3' from Israel (DIC hereafter) carries the closely linked genes *Gpc-B1* that significantly increases

grain protein content (see section 5 below) and a gene for high temperature stripe rust resistance (Uauy 2006a, b). Flanking molecular markers *Xuhw89* and *Xgwm193* (Fig. 2) were used to introgress *Yr36* and *Gpc-B1* into the HRS common wheat variety 'Anza'.

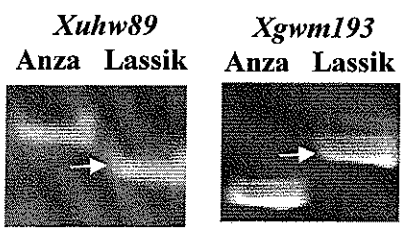


Fig. 2. Markers for *Gpc-B1* (*Xuhw89*) and *Yr36* (*Xgwm193*) genes. Arrows indicate wild alleles.

The common wheat variety 'Glupro' ('Columbus'/*T. turgidum* var. *dicoccoides* (FA15-3)//'Len') was used as the donor parent for *Gpc-B1* and *Yr36*. The *Gpc-B1* functional allele is absent in all cultivated wheats (Uauy et al. 2006b) and is present only in those few varieties (e.g. Glupro) where the gene has been introgressed from the wild *T. turgidum* var. *dicoccoides* (DIC). The *Xuhw89* allele associated with the high grain protein allele is also absent from all cultivated wheats and therefore its presence in Lassik provides a good diagnostic marker.

References

Uauy, C., J.C. Brevis, X. Chen, I.A. Khan, L. Jackson, O. Chicaiza, A. Distelfeld, T. Fahima, and J. Dubcovsky. 2005. High-temperature adult plant stripe rust resistance gene *Yr36* from *T. turgidum* ssp. *dicoccoides* is closely linked to the grain protein content locus *Gpc-B1*. TAG. 112: 97-105.

Uauy C., A. Distelfeld, T. Fahima, A. Blechl, J. Dubcovsky. 2006. A NAC gene regulating senescence improves grain protein, zinc and irons content in wheat. Science 314:1298-1300.

3. Lassik has better resistance to stripe rust than Anza in the field. The incorporation of stripe rust resistance genes *Yr17* and *Yr36* conferred Lassik improved resistance to stripe rust in several field studies (Table 1).

The original data for the final percent infection of the penultimate leaf (flag-1 leaf) measured at the soft-to medium dough stage of growth is presented in Table 1 of Exhibit D. Exhibit D includes additional information for the different locations used in this study, planting and harvesting dates and soil types. The summary statistics from the ANOVAs are included below in Table 1.

The percent final infection of the penultimate leaf was higher in Anza than in Lassik in the eight locations analyzed. The differences were statistically significant ($P<0.05$) in six of the eight locations and marginally significant ($P=0.05$) in one. These results confirmed that Lassik has a better field resistance to stripe rust than Anza.

Homogeneity of variances was confirmed by Levene's tests and normality of residuals was by the Shapiro-Wilk test. These results indicate that the results from the ANOVA are valid.

Table 1. Stripe rust. Statistical analyses of percent final infection of the penultimate leaf measured at the soft-to medium dough stage of growth. Data was analyzed by ANOVA as a Randomized Complete Block Design with 4 replications. The raw data is available in Exhibit D, Table 1. The date the data was measured is indicated after the location name.

	Delta 5/26/06		**Tulare** 5/17/06		**UC Davis** 5/24/06		**Madera** 5/17/06	
Block	Anza	Lassik	Anza	Lassik	Anza	Lassik	Anza	Lassik
Mean	**27.5**	**1.8**	**55.0**	**1.0**	**83.0**	**1.0**	**72.5**	**1.0**
SE	5.2	1.1	6.5	0.4	5.8	0.4	8.5	0.4
P ANOVA	0.017		0.004		0.0008		0.004	
F ANOVA	23.1		62.3		194.9		66.9	
Levene	0.12		0.07		0.13		0.11	
Shapiro-Wilk	0.55		0.29		0.68		0.94	
	Butte 5/3/06		**Colusa** 5/2/06		**Glenn** 5/3/06		**Kern** 5/17/06	
Block	Anza	Lassik	Anza	Lassik	Anza	Lassik	Anza	Lassik
Mean	**17.3**	**1.0**	**19.3**	**1.0**	**11.8**	**1.5**	**55.0**	**1.3**
SE	4.4	0.4	7.8	0.4	3.6	0.5	9.8	0.3
P ANOVA	0.03		0.10		0.05		0.011	
F ANOVA	13.5		5.35		10.4		31.5	
Levene	0.17		0.13		0.11		0.08	
Shapiro-Wilk	1.00		0.67		0.48		0.76	

4. Lassik has higher yield than Anza at Davis and Madera 2006

Lassik showed significantly higher yields than Anza in 2006 at the UC Davis Agronomy Farm (35% increase, P= 0.009) and Madera (39% higher, P=0.015). These are the two locations that exhibited the highest final levels of stripe rust infection, suggesting that the increased yield might be related to Lassik improved stripe rust resistance. Other locations showed no significant differences in yield. Data are summarized in Table 2.

No significant differences were detected by Levene's tests (P>0.05) indicating valid homogeneity of variances. Normality of the residuals was not rejected for any of the analysis by the Shapiro-Wilk test (P>0.05). These results indicate that the results from the ANOVA are valid.

In summary, Lassik presents better stripe rust resistance than Anza in most locations and that is translated in significant grain yield increases in the location where the stripe rust infection was more severe (Davis and Madera in 2006). The improved stripe rust resistance in Lassik is likely related to the incorporation of stripe rust resistance genes *Yr17* and *Yr36*.

Table 2. Anza and Lassik grain yields (**kg/ha**) at five locations in 2006. A detailed description of the locations is provided in Exhibit D. Data was analyzed by ANOVA as a Randomized Complete Block Design with four replications. The raw data is available in Exhibit D Table 2.

	Delta		Tulare		UC Davis	
Block	Anza	Lassik	Anza	Lassik	Anza	Lassik
Mean	**5368**	**5258**	**3734**	**3877**	**4969**	**6739**
SE	434	186	462	161	157	277
P ANOVA	0.79		0.78		**0.009**	
F ANOVA	0.09		0.09		35.7	
Levene	0.07		0.22		0.09	
Shapiro-Wilk	0.30		0.93		0.28	

	Madera		Kern	
Block	Anza	Lassik	Anza	Lassik
Mean	**5357**	**7474**	**3785**	**4296**
SE	159	333	247	369
P ANOVA	**0.015**		0.387	
F ANOVA	25.14		1.02	
Levene	0.09		0.36	
Shapiro-Wilk	0.12		0.88	

5. Lassik has better breadmaking quality than Anza

Anza has a poor breadmaking quality because of its low grain protein content and weak gluten, and was traditionally used in California as feed wheat. Lassik carries the functional *Gpc-B1* allele from wild tetraploid wheat which confers higher protein content than the non–functional allele present in Anza. In addition, Lassik has the high molecular weight glutenin (HMWG) alleles '1' and '5+10', which confer stronger gluten than the 'Null' and '2+12' HMWG alleles present in Anza (Exhibit A, Fig. 3).

To confirm the predicted effects of the introgressed genes, we performed complete breadmaking quality tests analyses using seeds from the 2006 yield trials grown at Davis, Madera, Kings and Kern as part of the Regional Testing program. Since seeds from single blocks were not sufficient for complete quality analyses, the first two and two last replications from the RCBD were pooled resulting in two samples per location.

We only had two replications per location, so we decided to perform a combined analysis over the four locations. The analysis per location with only two replications would not have adequate power. We used a conservative approach to declare differences significant. We considered locations as a random factor and blocks nested within locations. For this mixed model, the effect of variety on the different parameters was tested using the interaction variety * location as the

expected mean square error (as determined by SAS /TEST statement). This provides a conservative estimate of the effect of variety on breadmaking quality parameters, since it uses the larger interaction error as the denominator for the F test. The variety * location effect was tested using the residual error and the location effect using a synthetic error (the last one is not relevant for this study and is not included in Table 3.

Table 3. Comparison between Anza and Lassik breadmaking quality data. Data from four locations and two blocks per location. The raw data is available in Exhibit D, Table 3.

	Prot. % (12% MB)	Test weight	1000 kernel weight	Flour yield	Flour prot. %	Fall No. (sec)	Water abs. %	Farin. peak	Farin. M.T. (min)	Farin. depart. (min)	Loaf vol. C.C
Anza	12.2	61.7	31.2	66.2	10.9	393	57.7	4.0	8.3	10.2	760
Lassik	**13.6**	61.5	32.4	67.8	**12.0**	**421**	59.5	**8.4**	17.4	**20.3**	882
Variety P	**0.02**	0.81	0.07	0.11	**0.04**	**0.003**	0.10	**0.02**	0.07	**0.05**	0.07
Var. * Loc. P	0.66	0.31	0.82	0.27	0.55	0.96	0.54	0.83	**0.02**	**0.05**	0.03
Levene	0.65	0.17	0.65	0.36	0.41	0.88	0.90	0.22	0.06	0.06	0.19
Shapiro-Wilks	0.52	0.22	0.07	0.49	0.13	0.21	0.06	0.23	0.70	0.05	0.12

No significant differences were detected by Levene's tests indicating homogeneity of variances. Normality of the residuals was not rejected for any of the analysis by the Shapiro-Wilk test. These results indicate that the results from the ANOVA are valid.

Lassik showed significantly higher grain protein content than Anza (11% higher), both in the grain (P= 0.02) and the flour (P= 0.04), as expected by the presence of the *Gpc-B1* gene from DIC.

We also observed the improvement in gluten strength expected from the incorporation of the HMWG alleles '1' and 5+10'. The stronger gluten of Lassik resulted in significantly higher farinograph peaks than Anza (110% higher). Lassik also exhibited a longer mixing time (109% longer), longer departure time (98% longer), and larger loaf volume (16% larger) than Anza, but the differences for these three parameters were borderline non-significant ($0.05<P<0.07$). Lassik also exhibited a significantly higher falling number (7%, P= 0.003) than Anza.

Most of the Variety * Location interactions were not significant indicating consistent effects across locations. Only the three last parameters showed significant interactions.

In summary, Lassik has a better breadmaking quality than Anza. Lassik was evaluated at the Collaborative Wheat Quality Evaluation Program meeting at the California Farm Bureau Building, Sacramento, Thursday, October 4, 2006. Lassik samples were tested by ADM – wheat; Bay State Milling; Horizon Milling/Cargill – wheat; Cereal Food Processors, Inc., and the California Wheat Commission quality laboratory. All the participants agreed that Lassik has good breadmaking characteristics (Reports available at the California Wheat Commission).

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

Exhibit C

OBJECTIVE DESCRIPTION OF VARIETY
Wheat (*Triticum* spp.)

NAME OF APPLICANT (S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA	UC1495	Lassik

ADDRESS (Street and No. or RD No., City, State, Zip Code and Country)

University of California
1111 Franklin Street, 12th Floor
Oakland, CA 94607-5200

FOR OFFICIAL USE ONLY

PVPO NUMBER

200800176

PLEASE READ ALL INSTRUCTIONS CAREFULLY:

Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g., [0][9][9] or [0][9]) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: _____. Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

[1]
1 = Common
2 = Durum
3 = Club
4 = Other (Specify) _____

2. VERNALIZATION:

[1]
1 = Spring
2 = Winter
3 = Other (Specify) _____

3. COLEOPTILE ANTHOCYANIN:

[1] 1 = Absent 2 = Present

4. JUVENILE PLANT GROWTH:

[2] 1 = Prostrate 2 = Semi-Erect 3 = Erect

5. PLANT COLOR: (boot stage)

[2]
1 = Yellow-Green
2 = Green
3 = Blue-Green

6. FLAG LEAF: (boot stage)

[2] 1 = Erect 2 = Recurved
[2] 1 = Not Twisted 2 = Twisted
[1] 1 = Wax Absent 2 = Wax Present

7. EAR EMERGENCE:

[1][6][0] Number of Days (Average) = **56 days after March 1 (Davis, 2006)**

[ ][ ] Number of Days Earlier Than * _____

Same As * **Anza**

[ ][ ] Number of Days Later Than * _____

Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

8. ANTHER COLOR:

[1] 1 = Yellow 2 = Purple

14

9. PLANT HEIGHT: (from soil to top of head, excluding awns)

[0][9][5] cm (Average)

[ ][ ] cm Taller Than _____ *

Same As **Anza** *

[ ][ ] cm Shorter Than _____ *

10. STEM:

A. ANTHOCYANIN

[1] 1 = Absent 2 = Present

B. WAXY BLOOM

[2] 1 = Absent 2 = Present

C. HAIRINESS (last internode of rachis)

[1] 1 = Absent 2 = Present

D. INTERNODE

[1] 1 = Hollow 2 = Semi-Solid 3 = Solid

[4] Number of Nodes

E. PEDUNCLE

[1] 1 = Erect 2 = Recurved 3 = Semi-Erect

[1][6] cm Length

F. AURICLE

[1] Anthocyanin: 1 = Absent 2 = Present

[1] Hair: 1 = Absent 2 = Present

11. HEAD: (At Maturity)

A. DENSITY

[2] 1 = Lax
2 = Middense (Laxidense)
3 = Dense

B. SHAPE

[2] 1 = Tapering
2 = Strap
3 = Clavate
4 = Other (Specify) _____

C. CURVATURE

[2] 1 = Erect
2 = Inclined
3 = Recurved

D. AWNEDNESS

[4] 1 = Awnless
2 = Apically Awnletted
3 = Awnletted
4 = Awned

12. GLUMES: (At Maturity)

A. COLOR

[1] 1 = White
2 = Tan
3 = Other (Specify) _____

B. SHOULDER

[5] 1 = Wanting 2 = Oblique
3 = Rounded 4 = Square
5 = Elevated 6 = Apiculate
7 = Other (Specify) _____

C. SHOULDER WIDTH

[1] 1 = Narrow
2 = Medium
3 = Wide

D. BEAK

[3] 1 = Obtuse
2 = Acute
3 = Acuminate

E. BEAK WIDTH

[1] 1 = Narrow
2 = Medium
3 = Wide

F. GLUME LENGTH

[2] 1 = Short (ca. 7 mm)
2 = Medium (ca. 8 mm)
3 = Long (ca. 9 mm)

G. WIDTH

[1] 1 = Narrow (ca. 3 mm)
2 = Medium (ca. 3.5 mm)
3 = Wide (ca. 4 mm)

H. PUBESCENCE

[1] 1 = Not Present
2 = Present

13. SEED:

A. SHAPE

[1] 1 = Ovate
2 = Oval
3 = Elliptical

B. CHEEK

[1] 1 = Rounded
2 = Angular

C. BRUSH

[2] 1 = Short
2 = Medium
3 = Long

[1] 1 = Not Collared
2 = Collared

D. CREASE

[1] 1 = Width 60% or less of Kernel
2 = Width 80% or less of Kernel
3 = Width Nearly as Wide as Kernel

[3] 1 = Depth 20% or less of Kernel
2 = Depth 35% or less of Kernel
3 = Depth 50% or less of Kernel

E. COLOR

[3] 1 = White
2 = Amber
3 = Red
4 = Other (Specify) _____

F. TEXTURE

[1] 1 = Hard
2 = Soft
3 = Other (Specify) _____

G. PHENOL REACTION (See Instructions)

[-] 1 = Ivory
2 = Fawn
3 = Light Brown
4 = Dark Brown
5 = Black

H. SEED WEIGHT

[3][2] g/1000 Seed (whole number only)

I. GERM SIZE

[2] 1 = Small
2 = Midsize
3 = Large

14. DISEASE: PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

(0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

[0]	Stem Rust (*Puccinia graminis* f. sp. *tritici*)	[2]	Leaf Rust (*Puccinia recondita* f. sp. *tritici*) **Field strains**
[2]	Stripe Rust (*Puccinia striiformis*) **Field strains**	[0]	Loose Smut (*Ustilago tritici*)
[0]	Tan Spot (*Pyrenophora tritici-repentis*)	[0]	Flag Smut (*Urocystis agropyri*)
[0]	Halo Spot (*Selenophoma donacis*)	[0]	Common Bunt (*Tilletia tritici* or T. *laevis*)
[0]	*Septoria nodorum* (Glume Blotch)	[0]	Dwarf Bunt (*Tilletia controversa*)
[0]	*Septoria avenae* (Speckled Leaf Disease)	[0]	Karnal Bunt (*Tilletia indica*)
[3]	*Septoria tritici* (Speckled Leaf Blotch) **Field strains**	[0]	Powdery Mildew (*Erysiphe graminis* f. sp. *tritici*)
[0]	Scab (*Fusarium* spp.)	[0]	"Snow Molds"
[0]	"Black Point" (Kernel Smudge)	[0]	Common Root Rot (*Fusarium*, *Cochliobolus* and *Bipolaris* spp.)
[0]	Barley Yellow Dwarf Virus (BYDV)	[0]	Rhizoctonia Root Rot (*Rhizoctonia solani*)
[0]	Soilborne Mosaic Virus (SBMV)	[0]	Black Chaff (*Xanthomonas campestris* pv. *translucens*).
[0]	Wheat Yellow (Spindle Streak) Mosaic Virus	[0]	Bacterial Leaf Blight (*Pseudomonas syringae* pv. *syringae*)
[0]	Wheat Streak Mosaic Virus (WSMV)	[ ]	Other (Specify) _____
[ ]	Other (Specify) _____	[ ]	Other (Specify) _____
[ ]	Other (Specify) _____	[ ]	Other (Specify) _____
[ ]	Other (Specify) _____	[ ]	Other (Specify) _____

15. INSECT: (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

[0]	Hessian Fly (*Mayetiola destructor*)	[ ]	Other (Specify) _____
[0]	Stem Sawfly (*Cephus* spp.)	[ ]	Other (Specify) _____
[0]	Cereal Leaf Beetle (*Oulema melanopa*)	[ ]	Other (Specify) _____

10

15. INSECT: (continued) (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

PLEASE SPECIFY BIOTYPE (Where Needed)

0	Russian Aphid (*Diuraphis noxia*)		Other (Specify) _____
0	Greenbug (*Schizaphis graminum*)		Other (Specify) _____
0	Aphids		Other (Specify) _____

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS:

WHEAT DESCRIPTOR ILLUSTRATIONS

Section Numbers Correspond to the Numbers of the Sections on the Form

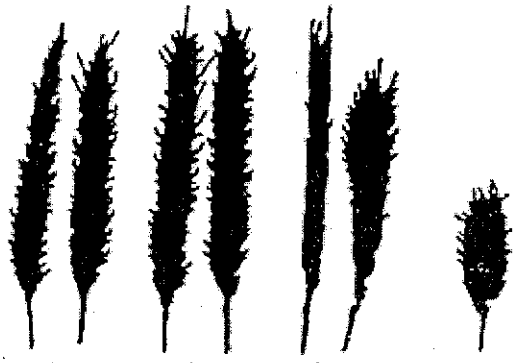
4. EARLY PLANT GROWTH HABIT:

1 Prostrate 2 Intermediate 3 Erect

10. (D.) STEM INTERNODE X-SECTION:

1 Hollow 2 Semi-solid 3 Solid

11. (B.) SPIKE SHAPE:

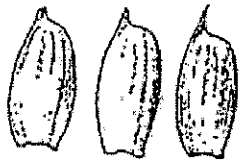


1 Tapering 2 Oblong 3 Clavate 4 Elliptical

11. (D.) AWNEDNESS:

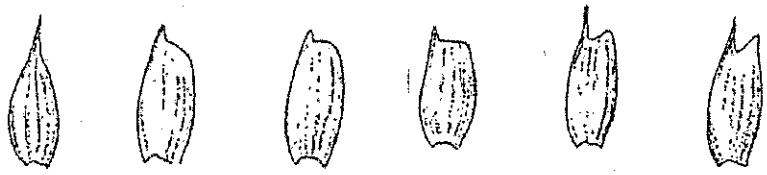
1 Awnless 2 Apically Awnleted 3 Awnleted 4 Awned

12. (D.) BEAK SHAPE:



1 Obtuse 2 Acute 3 Acuminate

12. (C.) SHOULDER SHAPE:



1 Wanting 2 Oblique 3 Rounded 4 Square 5 Elevated 6 Apiculate

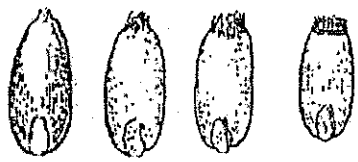
13. (A.) SEED SHAPE:

1 Ovate 2 Oval 3 Elliptical

13. (B.) CHEEK SHAPE:

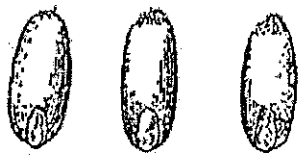
1 Rounded 2 Angular

13. (C.) BRUSH SIZE



1 Small 2 Midsized 3 Large 4 Collared

13. (C.) BRUSH HAIR LENGTH:



1 Short 2 Medium 3 Long

13. (I.) GERM (EMBRYO) SIZE:

1 Small 2 Midsized 3 Large

13. (D.) SEED CREASE WIDTH:

1 Narrow 2 Mid-wide 3 Wide

13. (D.)SEED CREASE DEPTH:

1 Shallow 2 Mid-Deep 3 Deep

"Lassik"

Exhibit D. Additional description and statistical analyses

Lassik was compared with Anza, which is the most similar variety. The data from Tables 1 and 2 were obtained from the 2006 Regional Performance Test performed by the UCD breeding program and by Dr. L. Jackson. Regional trials results are published in the 2006 "Regional barley, common and durum wheat, triticale, and oat performance tests" in California, Agronomy Progress Report #293 (http://agric.ucdavis.edu/crops/cereals/cereal.htm).

Data were analyzed with ANOVA (SAS 9.1) using randomized complete block designs (RCBD) with four replications. Homogeneity of variances was confirmed using Levene's tests. Normality of the residuals was confirmed with the Shapiro-Wilk test. Probability values for the Levene and Shapiro's tests are presented as part of the ANOVA analyses in Exhibit B. Blocks were 1.5 m wide and 6 m long, and seed density was 1.2 million seeds per acre.

The locations tested include:

Delta: Victoria Island Farms, Sacramento-San Joaquin Delta (Stockton), San Joaquin Co, CA. Soil type Egbert muck. This These location was planted 12/5/2005 and harvested 6/29/06.

Tulare: Changala Ranch, Ducor, CA. Soil type Centerville clay. This location was planted 11/29/2005 and harvested 6/07/06.

Davis: UC Davis Agronomy Farm, Yolo Co., CA. Soil type Yolo loam. This location was planted 11/16/2005 and harvested 7/17/06.

Madera: Dupont Research Facility, Madera, Madera Co, CA. Soil type Visalia Sandy loam. This location was planted 11/28/2005 and harvested 6/28/06.

Butte: Chico State University Farm, Chico, CA. Soil type Vina Loam. This location was planted 11/15/2005 and not harvested because of weed problem.

Colusa: Erdman Farms, Grimes, Colusa Co, CA. Soil type Egbert muck. This location was planted 11/14/2005 but was not harvested.

Glenn: Feeney Ranch. Willows, CA. Soil type Altamount clay. This location was planted 11/14/2005 and harvested 7/11/06.

Kern: J.G. Boswell, Kern, Kern Co, CA. Soil type Millox clay. This location was planted 12/9/2005 and harvested 6/19/06.

Table 1. Stripe rust. Percent final infection of the penultimate leaf (flag-1 leaf) measured at the soft-to medium dough stage of growth. Data was analyzed by ANOVA as a Randomized Complete Block Design with four replications.

	Delta 5/26/06		**Tulare** 5/17/06		**UC Davis** 5/24/06		**Madera** 5/17/06	
Block	Anza	Lassik	Anza	Lassik	Anza	Lassik	Anza	Lassik
1	15	1	50	1	98	1	80	1
2	40	0	70	0	70	1	50	2
3	30	5	60	1	84	0	70	0
4	25	1	40	2	80	2	90	1
Mean	**27.5**	**1.8**	**55.0**	**1.0**	**83.0**	**1.0**	**72.5**	**1.0**
SE	5.2	1.1	6.5	0.4	5.8	0.4	8.5	0.4

	Butte 5/3/06		**Colusa** 5/2/06		**Glenn** 5/3/06		**Kern** 5/17/06	
Block	Anza	Lassik	Anza	Lassik	Anza	Lassik	Anza	Lassik
1	10	1	40	1	3	0	80	2
2	14	2	3	2	10	2	60	1
3	15	0	20	1	14	2	35	1
4	30	1	14	0	20	2	45	1
Mean	**17.3**	**1.0**	**19.3**	**1.0**	**11.8**	**1.5**	**55.0**	**1.3**
SE	4.4	0.4	7.8	0.4	3.6	0.5	9.8	0.3

Table 2. Yield data (kg/ha). Yield data in kg per hectare. Data was analyzed by ANOVA as a Randomized Complete Block Design with four replications.

	Delta		**Tulare**		**UC Davis**	
Block	Anza	Lassik	Anza	Lassik	Anza	Lassik
1	4994	4951	2952	3447	4877	6156
2	4319	5148	5074	3813	4580	7068
3	6024	5798	3414	4157	5310	7337
4	6135	5134	3498	4091	5108	6396
Mean	**5368**	**5258**	**3734**	**3877**	**4969**	**6739**
SE	434	186	462	161	157	277

	Madera		**Kern**	
Block	Anza	Lassik	Anza	Lassik
1	5457	8055	3851	3315
2	4926	7982	3071	4910
3	5684	7197	4058	4142
4	5360	6663	4160	4818
Mean	**5357**	**7474**	**3785**	**4296**
SE	159	333	247	369

Table 3. Breadmaking quality. Comparison between Anza and Lassik for grain characteristics, experimental milling, farinograph and loaf volume. The first two and the last two blocks from each location were pooled to have enough grain for a complete baking analysis. Data was analyzed by ANOVA as a Randomized Complete Block Design with four replications. All test were done as blind samples at the California Wheat Commission Wheat Quality laboratory.

ANZA	Prot. % (12% MB)	Test weight	1000 kernel weight	Flour yield	Flour prot. %	Fall No. (sec)	Water abs. %	Farin. peak (min)	Farin. M.T. (min)	Farin. depart. (min)	Loaf vol. C.C
Davis	11.0	62.5	32.8	66.3	9.7	382	53.9	8.0	3.8	4.0	750
Davis	11.3	61.7	30.6	67.7	9.6	375	57.6	2.5	3.3	5.0	700
Madera	11.1	62.6	33.8	67.6	9.5	398	57.7	2.5	2.8	4.0	650
Madera	10.2	63.1	38.0	67.1	8.5	353	56.6	2.0	3.0	4.0	595
Kern	.	61.1	30.3	63.7	12.8	406	59.0	3.3	4.8	7.0	865
Kern	13.3	60.6	28.2	64.4	11.8	372	60.6	4.5	3.8	6.3	850
Kings	14.4	61.5	28.8	67.0	12.5	429	57.7	3.8	5.3	7.5	835
Kings	14.4	60.4	26.7	65.4	12.6	426	58.6	5.5	5.3	7.8	835
Avg.	**12.2**	**61.7**	**31.2**	**66.2**	**10.9**	**393**	**57.7**	**4.0**	**4.0**	**5.7**	**760**
SE	0.6	0.3	1.3	0.5	0.6	9.5	0.7	0.7	0.4	0.6	36.2
LASSIK											
Davis	13.0	62.2	32.9	67.6	11.4	417	58.3	5.0	18.3	20.0	890
Davis	12.1	63.1	35.1	69.4	10.9	410	59.9	10.5	17.0	19.0	845
Madera	14.0	63.1	34.8	71.1	12.5	402	63.0	13.0	14.0	20.0	935
Madera	10.7	64.1	39.3	69.1	9.3	391	57.0	5.5	9.3	11.0	765
Kern	14.0	61.4	30.3	66.8	12.3	392	61.6	9.5	10.3	14.3	950
Kern	15.1	61.0	30.6	66.5	13.2	436	59.9	5.0	6.5	8.8	985
Kings	15.0	56.9	30.9	64.7	13.5	457	59.0	9.5	36.5	39.0	840
Kings	14.6	60.1	24.9	66.9	13.0	462	57.5	9.0	27.3	30.0	845
Avg.	**13.6**	**61.5**	**32.4**	**67.8**	**12.0**	**421**	**59.5**	**8.4**	**17.4**	**20.3**	**882**
SE	0.5	0.8	1.5	0.7	0.5	9.9	0.7	1.0	3.6	3.5	25.5

E. Area of adaptation and primary use

Lassik performs well agronomically in all areas where it has been evaluated in California and has good quality characteristics for bread making. Lassik appears to be well suited for the Sacramento Valley and the Delta where it shows high yield potential under irrigation. Lassik combines high yield potential and excellent bread making quality and resistance to the major pathogens found in California. Its primary use is for bread production.

F. Procedure for maintaining stock seed classes

The Department of Plant Sciences, UCD will maintain Breeders seed. Foundation seed will be produced and distributed by the Foundation Seed program of the University of California, Davis. The California Crop Improvement Association will provide certification services. New Breeders seed will be produced as needed from head-row progenies obtained from the original Breeders Seed lot.

Foundation seed will not be limited to the number of generations. Foundation seed will be maintained solely by the University of California Foundation Seed Program. Registered seed will only be produced from Foundation seed. Certified Seed will be produced from Registered Seed (or Foundation Seed). Certified Seed can also be produced from Certified Seed only for one cycle. After that, Certified Seed needs to be produced from new Registered or Foundation Seed to maintain seed purity.

Characteristics to assist field inspectors

The most characteristic features of Lassik are its improved resistance to stripe rust relative to Anza. The two varieties are morphologically very similar but have different gluten proteins and significant differences in protein content.

REPRODUCE LOCALLY. Include form number and edition date on all reproductions. FORM APPROVED - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued *(7 U.S.C. 2421)*. The information is held confidential until the certificate is issued *(7 U.S.C. 2426)*.

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
The Regents of the ~~Univ.~~ University of California	UC1495	LASSIK
4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*	**5. TELEPHONE** *(Include area code)*	**6. FAX** *(Include area code)*
University of California 1111 Franklin Street, 12th Floor Oakland, California 94607-5200	(510) 587-6000	(510) 587-6090
	7. PVPO NUMBER	**#200800176**

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. **If no, please explain.** ☑ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? **If no, give name of country.** ☑ YES ☐ NO

10. Is the applicant the original owner? ☑ YES ☐ NO **If no, please answer one of the following:**

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?
☐ YES ☐ NO **If no, give name of country**

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?
☐ YES ☐ NO **If no, give name of country**

11. Additional explanation on ownership *(Trace ownership from original breeder to current owner. Use the reverse for extra space if needed)*:

Breeders are employees of applicant/owner

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.

2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.

3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT F
DECLARATION REGARDING DEPOSIT

NAME OF OWNER (S)	ADDRESS *(Street and No. or RD No., City, State, and Zip Code and Country)*	TEMPORARY OR EXPERIMENTAL DESIGNATION
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA	University of California 1111 Franklin Street, 12th Floor Oakland, CA 94607-5200	UC1495 VARIETY NAME Lassik
NAME OF OWNER REPRESENTATIVE (S)	**ADDRESS *(Street and No. or RD No., City, State, and Zip Code and Country)***	FOR OFFICIAL USE ONLY
MICHAEL R. WARD	MORRISON FOERSTER LLP 425 Market Street San Francisco, CA 94105	PVPO NUMBER #200800176

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.

Signature

Date 3/19/08